Collision Risk Modeling in the Northern Pacific Airspace under Separation Reduction and Improvements in Navigational Performance

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In this paper, we develop a collision risk model for the Northern Pacific airspace taking into consideration a reduction in separation standards, and enhancements in the navigational performance. New methods are proposed which consider pairwise interactions between aircraft, and a modified application of the Reich collision risk model is introduced. Simulation programs are developed and applied to various scenarios, and results including risk estimates are obtained. This study utilizes components of the Northern Pacific Airspace Cost Effectiveness (NPACE) Study, which uses simulated flight data to investigate the effects of future changes to the airspace. The risk assessment of the Northern Pacific airspace shows that by having more flights with RNP-4 designation and supported by careful management of airspace operations to reduce lateral navigational errors, the enhanced navigational accuracy results in lower lateral overlap probabilities, which lead to lower estimated risk in all scenarios. The research shows that given the assumptions of the study, all scenarios of various RNP percentages and track separation generate a collision risk estimate below the Target Level of Safety (TLS).

Excess Flying Time In the National Airspace System

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Air Traffic Management (ATM) in the United States is performed by the Federal Aviation Administration (FAA). Air Traffic Management controls airspace and airport resources, and promotes safe, expeditious movement of air traffic. A basic question that is often raised is how much inefficiency exists in today’s ATM system. Why is it that identical aircraft, leaving the same airport and arriving at the same destination, can take dramatically different amounts of time? The answers to these questions may be useful for making funding decisions to enhance efficiency. In this article, we develop and apply a new method to assess the inefficiency of airborne aircraft. We examine sets of flights, select the minimum flying time in each set, and define the excess flying time of each flight as the amount exceeding the minimum flying time. Excess flying time is a rough measure of inefficiency in that it provides an approximate upper bound on potential benefits achievable through its elimination. For the data examined, we found an average excess flying time of 5.5 to 7.5 minutes per flight, depending on weather conditions and how much of the airborne portion of the flight we included. Assuming an average cost of $45.30 per minute of flying time [GRA Incorporated, 2004], potential savings on a national scale quickly add up to substantial amounts of money.
Operational Evaluation of Traffic Management Advisor Using Statistical Performance Metrics and Simulation Approach

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The Traffic Management Advisor (TMA) is an air traffic management automation tool designed to allow more aircraft to land during the peak arrival periods by increasing the airspace capacity and minimizing delay via better scheduling, spacing, sequencing, and runway allocation of arrival traffic. This paper evaluates the TMA’s operational performance at George Bush Intercontinental airport in Houston over three daily selected rush hour periods in the pre- and post-TMA deployments, using both the conventional and newly proposed performance metrics. The performance metrics used for the statistical analysis include: flight distances flown during transition from en route to terminal airspace, runway arrival distributions, and airport arrival traffic distributions. The results obtained from the analysis show that TMA improves the characteristics of arrival air traffic by better runway balancing, improved airport arrival throughput, and more evenly distributed airport arrivals. In addition to the statistical analysis, a model is developed to simulate aircraft transit between arrival arcs and meter fixes, queuing, and runway arrivals during a selected rush hour period in the post-TMA era.